TABLE 12.—*Air and water temperatures at Tobico, near Bay City*—Cont'd.

Hour.	1904. Aug. 18. Tobico, air.	Aug. 18. Tobico, Saginaw Bay.	Aug. 22. Tobico, air.	Aug. 22. Tobico, Saginaw Bay.	Aug. 23. Tobico, air.	Aug. 23. Tobico, Saginaw Bay.	Aug. 25. Tobico, air.	Aug. 25. Tobico, Saginaw Bay.	Aug. 26. Tobico, air.	Aug. 26. Tobico, Saginaw Bay.
	°	°	°	°	°	°	°	°	°	°
1:00 a. m.	.....	.....	.....	.....	53	67.3	.....	.....	48	65
3:00 a. m.	.....	.....	.....	.....	51	66.5	.....	.....	46	64
5:00 a. m.	.....	.....	.....	.....	.....	.....	.....	.....	46	63.3
5:30 a. m.	57	66	.....	.....	50	66	72	68	46.5	64
7:30 a. m.	65.4	68	.....	.....	61	67	76	70	.....	.....
8:30 a. m.	65.5	68.6	.....	.....	69	68	79	71.5	.....	.....
9:30 a. m.	70.5	69.8	.....	.....	69.5	69	79	72.5	.....	.....
10:30 a. m.	69.3	72.2	.....	.....	72.5	70.4	79	72.5	.....	.....
11:15 a. m.	75.2	74	.....	.....	74	71.7	80.5	73.4	.....	.....
1:00 p. m.	73.3	74.8	73	73.2	.....	.....	85	75.3	.....	.....
2:00 p. m.	73.4	75.3	75.5	74.5	.....	.....	79	75.1	.....	.....
3:00 p. m.	73	75	76	74.2	.....	.....	78.2	75.5	.....	.....
4:00 p. m.	73	74.1	74.2	73.6	.....	.....	74.1	74.5	.....	.....
5:00 p. m.	72	73	72.6	72.6	.....	.....	70.5	73.5	.....	.....
6:45–7:00 p. m.	68	71	62.6	71	.....	.....	63	69	.....	.....
9:00 p. m.	.....	.....	59	69	.....	.....	55	66.5	.....	.....
11:00 p. m.	.....	.....	55	68	.....	.....	50.5	66	.....	.....
Average	69.7	71.8	.....	.....	*64.5	*69.9	.....	.....	*67.07	*69.9

* Average of the 24-hour period ending with the last observation of this date.

climate of lower Michigan. Moreover, the temperature of the water, as a rule, being greater than that of the air from about 7 p. m. until about 9 a. m. the day following, the tendency would be to increase the temperature of the adjacent shores. On the other hand, the air temperature being greater during the remainder of the day, the water would tend to establish an equilibrium by reducing the air temperature, the mean range probably approaching a mean of the average ranges of air and water temperatures. The more prolonged period of higher water temperature is doubtless the greater factor in this question.

INTERNATIONAL METEOROLOGICAL DEFINITIONS AND SYMBOLS.

Compiled by E. R. MILLER. Dated Washington, D. C., January 1, 1906.

Progress in meteorology, both practical and theoretical, depends, more than in the case of other sciences, upon international uniformity in methods of observing, recording, and publishing data. Such uniformity may be secured by adherence to the recommendations of the international meteorological congresses, conferences, and committees. The reports of the meetings of these organizations have been published in the principal European languages, including English, and the resolutions and recommendations of the various conferences from 1872 to 1891 were codified and published by Prof. H. Wild, of St. Petersburg, in his Repertorium für Meteorologie, Band XVI, No. 10, 1893.

The nomenclature, definitions, and classification of clouds recommended by the International Meteorological Committee in 1894, was made the official system of the United States Weather Bureau in 1895.

The international meteorological symbols were devised by the permanent committee appointed by the International Meteorological Congress that met in Vienna in September, 1873. A few additional symbols have been adopted and the official definitions have been modified at the meetings held at Munich in 1892, at Paris in 1896, and at Innsbruck in 1905. With the exception of the thunderstorm symbol (⚡) they have not been adopted by the United States Weather Bureau for use by its regular observers, but were recommended for use by the cooperative observers in a circular issued by the Chief Signal Officer in 1883, and again by the Chief of the Weather Bureau in a circular dated January 1, 1894. They were introduced for the first time into the tables of data published in the Annual Report of the Chief of the Weather Bureau in the volume for 1903–04.

The circular of January 1, 1894, unfortunately contained several typographical errors, which also crept into the subsequent reprints of that circular in the Smithsonian Meteorological Tables, edition of 1897, in the MONTHLY WEATHER REVIEW for July, 1898, page 311, and in the Classification of Clouds and International Meteorological Symbols recently published by the Weather Bureau.

It is with a view to presenting a complete and accurate statement to American observers that the following revision has been prepared.

We are indebted to Mr. A. L. Rotch, American member of the International Cloud Committee and Director of the Blue Hill Observatory, and Messrs. H. H. Clayton and S. P. Ferguson, of the Blue Hill Observatory staff, for valuable criticisms and the notes accompanying this article.

CLASSIFICATION OF CLOUDS.

Upper clouds.—Cirrus (*a*). Cirro-stratus (*b*).

Intermediate clouds.—Cirro-cumulus (*a*). Alto-cumulus (*a*). Alto-stratus (*b*).

Lower clouds.—Strato-cumulus (*a*). Nimbus (*b*).

Clouds formed by diurnal ascending currents.—Cumulus. Cumulo-nimbus.

High fogs.—Stratus.

The clouds marked (*a*) usually occur in separate or rounded masses and are most frequently seen in dry weather. Those marked (*b*) are forms which are widely extended or completely cover the sky, as in wet weather.

HEIGHTS OF CLOUDS.

In the following table[1] are given the mean heights of clouds as determined by observations during the "cloud year" 1896–97, except in the case of Allahabad, where the observations were made from December, 1898, to March, 1900:

Mean heights of clouds.

SUMMER.

Kind of clouds.	Upsala, Sweden.	Pavlovsk, Russia.	Potsdam, Germany.	Trappes, France.	Toronto, Canada.	Blue Hill, Mass.	Washington, D. C.	Allahabad, India.	Manila, P. I.
	m.	m.	m.	m.	m.	m.	m.	m.	m.
Cirrus	8,176	8,814	9,054	8,936	10,901	9,525	10,358	10,765	11,133
Cirro-stratus	6,362	8,094	8,085	7,851	8,943	10,099	10,620	.....	12,968
Cirro-cumulus	6,457	4,600	5,893	5,826	8,883	6,673	8,826	11,278	6,823
Alto-stratus	2,774	.....	3,293	3,792	4,241	6,247	5,772	.....	4,302
Alto-cumulus	3,432	3,053	3,632	3,676	3,516	3,763	5,030	4,502	5,707
Strato-cumulus	1,771	1,847	2,163	1,815	2,005	1,160	2,870	.....	1,901
Nimbus	1,197	.....	1,792	1,079	.....	1,189	1,926	836	1,382
Cumulus	1,685	1,764	1,880	1,574	1,697	.....	.....	1,757	1,826
Cumulus (summit)	2,000	2,406	2,100	2,160	.....	2,900	3,068	.....	.....
Cumulus (base)	1,454	1,635	1,445	.....	.....	1,781	1,182	.....	.....
Fracto-cumulus	1,832	2,146	1,707	1,402	.....	.....	.....	.....	.....
Cumulo-nimbus	.....	.....	.....	.....	.....	.....	.....	1,714	6,454
Cumulo-nimbus (summit)	3,971	4,682	3,990	5,485	.....	9,031	4,965	.....	.....
Cumulo-nimbus (base)	.....	1,615	2,057	2,525	.....	1,601	1,750	.....	.....
Stratus	.....	839	675	944	.....	510	838	.....	1,065

WINTER.

Cirrus	6,980	8,740	8,070	8,514	9,978	8,612	9,511	12,884	10,634
Cirro-stratus	5,455	7,090	7,653	5,849	8,530	8,893	9,526	13,342	11,638
Cirro-cumulus	6,131	5,985	5,406	5,634	8,246	6,155	7,413	11,553	6,421
Alto-stratus	4,090	.....	2,988	3,822	4,180	4,574	4,801	.....	.....
Alto-cumulus	4,114	3,172	3,349	4,274	2,494	3,658	3,822	6,257	4,638
Strato-cumulus	1,964	1,501	1,415	1,614	1,542	1,604	2,399	3,550	2,322
Nimbus	987	.....	1,285	1,053	.....	646	1,804	5,003	1,488
Cumulus	1,516	.....	1,499	1,112	1,326	.....	.....	1,344	1,821
Cumulus (summit)	1,649	1,602	1,744	2,371	.....	1,623	2,855	.....	.....
Cumulus (base)	714	1,118	991	.....	.....	1,544	1,198	.....	.....
Fracto-cumulus	1,219	.....	1,025	1,429	.....	.....	.....	2,619	.....
Cumulo-nimbus	.....	.....	.....	.....	.....	.....	.....	2,521	3,136
Cumulo-nimbus (summit)	5,175	.....	4,735	3,850	.....	.....	3,730	.....	.....
Cumulo-nimbus (base)	1,377	.....	3,825	.....	.....	.....	.....	.....	.....
Stratus	506	1,000	607	.....	.....	608	1,132	.....	.....

An inspection of the table will suffice to establish the validity of the following rules:

[1] Rapport sur les observations internationales des nuages au Comité International Météorologique par H. Hildebrand Hildebrandsson. Part II, 1905, Table I, page 2.

1. The heights of clouds, especially upper clouds, decrease from the equator toward the poles.

2. The heights of clouds are greater in summer than in winter in the temperate zones. In India they are, in general, higher during the northeast monsoon than during the southwest monsoon.

DESCRIPTION OF CLOUDS.[2]

The following descriptions are quoted from the English text of the International Cloud Atlas, Paris, 1896, with some modifications to make them agree with the French and German texts, and other modifications adopted by the conference at Innsbruck in September, 1905, and which will appear in the new edition of the cloud atlas.

Cirrus (*Ci*.[3]).—Detached clouds, delicate and fibrous looking, taking the form of feathers, generally of a white color, sometimes arranged in belts which cross a portion of the sky in "great circles," and, by an effect of perspective, converge toward opposite points of the horizon; the Ci.-St. and the Ci.-Cu. often contribute to the formation of these belts.

Cirro-stratus (*Ci.-St.*[4]).—A thin, whitish sheet; at times completely covering the sky and giving it a whitish appearance, when it is sometimes called cirro-nebula, or at other times presenting, more or less distinctly, a formation like a tangled web. This sheet often produces halos around the sun and moon.

Cirro-cumulus (*Ci.-Cu.*).—Small globular masses or white flakes without shadows, or having very slight shadows, arranged in groups and often in lines.

Alto-cumulus (*A.-Cu.*).—Rather large globular masses, white or grayish, partially shaded, arranged in groups or lines, and often so closely packed that their edges appear confused. The detached masses are generally larger and more compact (changing to St.-Cu.) at the center of the group; at the margin they form into finer flakes (changing to Ci.-Cu.). They are often spread out in lines in one or two directions.

Alto-stratus (*A.-St.*[4]).—A thick sheet of gray or bluish color, showing a brilliant patch in the neighborhood of the sun or moon, and which, without causing halos, may give rise to coronæ. This form goes through changes like those of the cirro-stratus, but its altitude is one-half as great.

Strato-cumulus (*St.*[4]*-Cu.*).—Large globular masses or rolls of dark cloud, frequently covering the whole sky, especially in winter, and occasionally giving it a wavy appearance. The layer of strato-cumulus is not, as a rule, very thick, and patches of blue sky are often visible through the intervening spaces. All sorts of transitions between this form and the alto-cumulus are noticeable. It may be distinguished from nimbus by its globular or rolled appearance, and also because it does not bring rain.

Nimbus (*Nb.*[4]). *Rain cloud.*—A thick layer of dark clouds, without shape and with ragged edges from which continued rain or snow generally falls. Through the openings in these clouds an upper layer of cirro-stratus or alto-stratus may almost invariably be seen. If the layer of nimbus separates into shreds, or if small, loose clouds are visible floating at a low level, underneath a large nimbus, they may be described as fracto-nimbus. (Fr.-Nb.) (The "Scud" of sailors.)

Cumulus (*Cu.*[5]). *Woolpack clouds.*—Thick clouds of which the upper surface is dome-shaped and exhibits protuberances while the base is horizontal. These clouds appear to be formed by a diurnal ascensional movement, which is almost always observable. When the cloud is opposite the sun, the surfaces presented to the observer have a greater brilliance than the margins of the protuberances. When the light falls aslant, these clouds show deep shadows; when these clouds are on the same side as the sun they appear dark, with bright edges.

The true cumulus has definite superior and inferior limits. It is often broken up by strong winds, and the detached portions undergo continual changes. These portions are distinguished by the name of fracto-cumulus, (Fr.-Cu.).

Cumulo-nimbus (*Cu.-Nb.*[4]). *Thundercloud, shower-cloud.*—Large masses of clouds, rising in the form of mountains, turrets, or anvils, generally having a sheet or screen of fibrous appearance above ("false cirrus"[6]) and a mass of cloud similar to nimbus underneath. From the base there usually fall local showers of rain or of snow (occasionally hail or sleet). Sometimes the upper edges have the compact cumulus form, forming into massive peaks round which the delicate "false cirrus" floats, and sometimes the edges themselves separate into a fringe of filaments similar to that of the cirrus cloud. This last form is particularly common in spring showers.

The front of a thundercloud of wide extent frequently presents the form of a large arch spread above a portion of the sky which is uniformly brighter in color.

Stratus (*St.*[4]).—A uniform sheet of cloud, analogous to fog, but not touching the ground. The complete absence of detail distinguishes stratus from the compact sheets formed by other clouds. When this sheet is broken up into irregular shreds by the wind, or by the summits of mountains, it may be distinguished by the name of fracto-stratus. (Fr.-St.)

INTERNATIONAL METEOROLOGICAL SYMBOLS.[7]

The international symbols were devised for the sake of brevity, and to provide characters independent of language to represent the word or words used in any language to designate the respective phenomena.

These symbols are convenient for use in manuscript records and are now almost universally employed in the publications of the various national weather services; consequently all American observers should be familiar with them.

In any publication defining the use of these symbols the official definitions by the international meteorological congresses and committees should appear first without modification. Any additional explanation for the benefit of students and observers should be supplementary, and should be kept separate.

It is suggested that in the publication of climatological data the symbols appear in tabular form, as shown below (this plan having been adopted by many institutions), and that the arrangement of the text relative to the symbols be as follows:

1. Title.

[2] In order to secure complete uniformity in the observations the conference at Innsbruck requested authors of meteorological treatises or instructions to reproduce *verbatim* the definitions of the International Cloud Atlas without additions or changes.

[3] It is recommended by the conference that the abbreviated name of the cloud observed be underlined when the form is typical, e. g., *A.-Cu*, and that the kind of cloud from which rain falls be noted.

[4] It is recommended by the conference that nimbus be abbreviated to Nb. and stratus to St. in order to avoid confusion with the abbreviation N=north, and S=south.

[5] The form assumed by certain clouds, particularly during the sirocco, mistral, or foehn, i. e., that of an ovoid with sharp edges, and sometimes iridescent, is called lenticularis, e. g., cumulus lenticularis. During the summer all low clouds, as a rule, assume special forms resembling more or less the cumulus; these are called stratus or nimbus cumuliformis.

It sometimes happens that a cumulus presents a mammilated lower surface. This appearance should be noted under the name of mammato-cumulus.

It should always be noted whether the clouds are stationary or in rapid motion.

[6] Tonitro-cirrus or thunderstorm-cirrus would be a better name than "false cirrus." *H. H. C.*

[7] At Blue Hill the symbols are used only to define a process and not a result. For example, ✳ means that snow fell at a certain time, not that snow lies on the ground at the time of observation. In a like manner ∞ means that ice formed over objects during a given interval, not that it covers the object at the time of observation. The same is taken as true of hail, sleet, frostwork, etc. Any other interpretation, it seems to us, would result in confusion, but this usage has not been definitely adopted by international agreement.—*H. H. C.*

2. Descriptive or introductory paragraph stating authority and reasons for using these symbols.

3. Table of symbols.

4. Paragraph describing the use of exponents, abbreviations for time, duration, etc.

5. Supplementary description or detailed explanation.

The great saving of space and time attained by the use of the symbols is indicated by the following example:

1 ↯ 9 p. — 10 p. in E; 3 ◍ 11 p. —; 4 ○ — 10 a., ⚐↯ 3 p. — 5 p.

The translation of which is as follows: On the 1st, sheet lightning was observed from 9 to 10 p. m. in the east; 3d, rain began at 11 p. m. and continued during the night; 4th, rain ended at 10 a. m. and thunderstorm prevailed from 3 to 5 p. m.

The international symbols and their equivalents are as follows:

English terms.	*French terms.*	*German terms.*
◍ Rain.	Pluie.	Regen.
✳ Snow.	Neige.	Schnee.
⊠ Snow on ground.	Sol couvert de neige.	Schneedecke.
⊹→ Drifting snow.	Tempête de neige.	Schneegestöber.
← Floating ice crystals.	Aiguilles de glace.	Eisnadeln.
▲ Hail.	Grêle.	Hagel.
△ Sleet.	Grésil.	Graupeln.
V { Silver thaw, Frostwork. }	Givre.	Rauhfrost, Duft.
ᔓ { Glazed frost, Ice storm. }	Verglas.	Glatteis.
⌙ Hoarfrost.	Gelée blanche.	Reif.
⌓ Dew.	Rosée.	Thau.
≡ Fog.	Brouillard.	Nebel.
≡: Damp fog, mist.	Brouillard qui mouille.	Nebel welcher nässt.
≡ Ground fog.	Brouillard bas.	Bodennebel.
∞ Haze, dust haze.	Brouillard sec, brume.	Dunst, Höhenrauch.
⚐↯ Thunderstorm.	Orage.	Gewitter.
T Thunder.	Tonnerre lointain.	Donner.
↯ Sheet lightning.	Éclairs sans tonnerre.	Blitz, Wetterleuchten.
⎓ Strong wind.	Vent fort.	Starker Wind.
◯ Solar corona.	Couronne solaire.	Sonnenring.
⊕ Solar halo.	Halo solaire.	Sonnenhof.
◡ Lunar corona.	Couronne lunaire.	Mondring.
◡ Lunar halo.	Halo lunaire.	Mondhof.
◠ Rainbow.	Arc-en-ciel.	Regenbogen.
⌓ Aurora.	Aurore polaire.	Polarlicht, Nordlicht.
⟑ Zodiacal light.	Lumière zodiacale.	Zodiakallicht.

The intensity of a phenomenon is denoted by an exponent; (⁰) indicating slight intensity, the absence of an exponent moderate intensity, and (²) great intensity.

The continuance of a phenomenon is indicated by a dash (—).

◍ *Rain.*—Indicates that rain is falling or has fallen during the day, since the last observation. [See foot note No. 7.—*C. A.*]

✳ *Snow.*—Indicates that snow is falling or has fallen since the last observation; ✳⁰ may be used to denote light snow, or snow in which only light scattered flakes fall; ✳² indicates a rapid fall of snow.

⊠ *Snow, on ground.*[8]—Snow lying on the ground, when more than half the ground in the neighborhood of the station is covered with snow. If the snow covering is thin use ⊠⁰; but if it is considered deep for the station use ⊠².

⊹→ *Drifting snow.*—This symbol indicates that strong winds are raising the snow from the ground, filling the air with it, and transporting it horizontally; this may occur under a clear sky. The symbol does not refer to snow falling from the clouds, nor to the mere fact that the snow is lying in drifts on the ground. When the air is filled with blinding snow dust, use the symbol ⊹→², but for light snow dust use ⊹→⁰.

← *Floating ice crystals.*[9]—Small ice crystals floating in the air usually observed during or immediately after very cold weather. If clouds are observed they are usually very thin and broken.

▲ *Hail.*—The fall of hard transparent ice pellets or nodules, whether small or large, crystalline or rounded. ▲⁰ indicates a small quantity of hailstones; ▲² a large quantity of hailstones, or a rapid fall of hail.

△ *Sleet.*—Pellets of snow, or soft hail, without any crystalline structure. This symbol is used by the Germans for graupeln or snow pellets, and for the semitransparent mixture of snow and ice that in central Europe nearly corresponds to the sleet of England and America. △⁰ should be used to indicate a small fall of sleet; △² much sleet.

V *Silver frost, or silver thaw. Frost-work.*[10]—This refers to an accumulation of frost on the limbs of trees, etc. The external appearance is silvery white and rough. It is observed during foggy weather when the temperature is below freezing or else after a cold spell when the temperature rises rapidly and stones, etc., remain colder than the air.

ᔓ *Glazed frost.*—This refers to an accumulation of ice on trees. The external appearence is smooth and transparent. In using the symbols for silver frost and glazed frost these terms are to be considered as descriptive of the resulting phenomena no matter how they are brought about, therefore the definitions avoid any statement as to the conditions attending the formation of the deposits. The same rule applies to the use of the symbol for hoarfrost.

⌙ *Hoarfrost.*— ⌙⁰ light hoarfrost; ⌙² heavy hoarfrost, injurious to vegetation. The expression frosty weather refers to the low temperature as such; but the expression hoarfrost refers to the deposit of fine ice crystals upon the surface of solids in the open air. Hoarfrost is generally deposited on objects under a clear sky at night.

⌓ *Dew.*— ⌓⁰ light dew; ⌓² heavy dew. As the formation of dew depends upon the nature and exposure of the surface on which the dew is deposited, the observer should use the same horizontal surface exposed uniformly throughout the season.

≡ *Fog.*—A dry fog enveloping the observer; ≡⁰ thin fog; ≡² heavy or dense fog.

≡: *Damp fog.*—A fog that wets as distinguished from fog that does not collect upon surrounding objects.

≡ *Ground fog.*—Fog that does not exceed the height of a man.

These fog symbols are not to be used when an observer at a high station observes fog in the valley below him; such an observation should be recorded as a note in the daily journal.

∞ *Haze.*—Such as makes distant mountains appear hazy, or such as covers the sky in the case of Indian summer haze, or prairie fires. If clouds are also prevalent in connection with this haze, the proper cloud symbol should be given in addition. The intensity, or density, of the haze is expressed by ∞⁰ for light haze and ∞² for dense haze. The symbol ∞ indicates merely the hazy condition or the optical result, without considering whether the haze is caused by dust or moisture.

⚐↯ *Thunderstorm.*—Thunder, whether with or without light-

[8] This symbol indicates that the ground near the station is more than half covered with snow. The depth may be indicated in a separate column or next the symbol, thus: ⊠10 or ⊠10; but when this is done the exponent seems unnecessary.—*S. P. F.*

[9] This phenomenon resembles snow and occurs sometimes when the sky is nearly or quite clear and temperature quite low. It is probably sometimes recorded as "snow from cloudless sky."—*H. H. C.*

[10] This symbol is at present employed to indicate two entirely different phenomena: (1) the accumulation of frost-work on the windward sides of trees, buildings, etc., when enveloped in fog at temperatures below freezing, and (2) the coating of frost appearing on rocks, etc., when there is a rapid rise of temperature after protracted cold weather. The first phenomenon is frequent in winter on mountains.—*H. H. C.*

ning, rain, hail, or wind. This symbol will be used to indicate all cases when the storm is supposed to have passed near the station.

T *Thunder.*—Distant thunder.

≤ *Lightning.*[11]—Distant lightning, usually called sheet or heat lightning. ≤⁰ faint lightning; ≤² brilliant lightning. When distant lightning appears at a definite direction in the horizon the observer should enter in the record the point of the compass, e. g., ≤⁰ NW. 10 p. for "distant heat lightning in the northwest at 10 p. m."

⟙ *Strong wind, or gale.*[12]—The feathering of the arrow may be varied to indicate the force of the wind according to the Beaufort scale, or the symbol, an arrow with 4 feathers, may be used to indicate a wind whose strength is 8, 9, or 10 on the Beaufort scale, or any velocity in excess of 50 miles per hour or 20 meters per second in absolute measures; ⟙² a remarkably strong wind or one exceeding 11 on the Beaufort scale or 80 miles per hour, or 35 meters per second.

⦶ *Solar aureole, corona, or glory.*[13]—Used for small circles of prismatic color surrounding the sun. The radii of these circles are usually less than 6°, but in the extreme case of Bishop's ring the radius is 15°. Several concentric circles are sometimes visible; each circular band of prismatic colors has its red on the outside and its blue, violet, or purple on the inside, with respect to the sun. Such rings are generally formed when the sun shines through a thin cloud, and may be seen if viewed through a neutral tinted glass or by reflection in water. A smaller circle surrounding the shadow of the observer's head is called an anthelion, aureole, glory, or fog shadow.

☋ *Lunar aureole or corona.*[13]—A small circle surrounding the moon similar to the solar corona.

⊕ *Solar halo.*[13]—Used for larger circles surrounding the sun, whose sizes are quite definite, namely, about 22° and 45° radius from the sun. They are easily distinguishable from the coronas by the fact that the colors are feebler and are so arranged that the red color is inside or nearest the sun and the blue color is outside. The greater part of the breadth of the halo is white. Complex combinations of halos, parhelia, horizontal circles, and vertical columns sometimes occur. In the symbol ⊕² the exponent indicates that the display is more brilliant than usual. A detailed statement of the radii or diameters of the rings and columns and of their arrangement should be given in the station journal.

☽ *Lunar halo.*[13]—A circle surrounding the moon similar to the solar halo.

◠ *Rainbow.*[13]—Brilliant rainbows may be indicated by ◠². When there are adjacent or supernumerary bows it should be indicated in the journal.

⌓ *Aurora.*—Any display of the aurora borealis or aurora australis.

⟑ *Zodiacal light.*—The International Conference at Innsbruck, September, 1905, recommended that observations of this phenomenon be made wherever practicable. It is seen as a triangular beam of light rising from the horizon in the west after the end of evening twilight in the winter and spring, or in the east before daybreak from September to January.

DEPOSIT OF ICE COLUMNS.

By E. R. MILLER.

On December 25, 1905, the ground in the vicinity of Cabin John Bridge, eight miles west of Washington, D. C., was observed to be covered, especially where bare of vegetation, with a heavy deposit of ice columns. Where exposed to the sun the deposit had the appearance of rough shaggy fur; in shaded places the tops of the crystals were evenly covered with a thin crust of ice to which the crystals remained attached when lifted from the ground. The accompanying reproduction of a photograph shows such a fragment. The crystals photographed were about three inches long, and were of a fibrous appearance. The individual crystals were irregular in section and were from $\frac{1}{16}$ to $\frac{3}{16}$-inch in thickness. Most of the columns noticed had formed above the ground, but in some places they had formed in the soil.

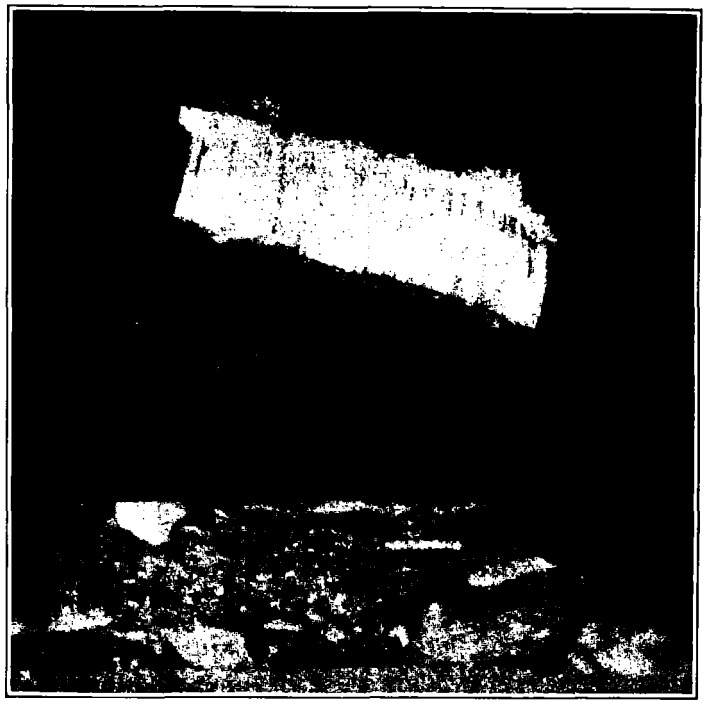

Fig. 1.—Deposit of ice columns.

The soil where the phenomenon occurred is loose and sandy. Rain to the amount of 2.03 inches (at Washington) fell during the night of the 20th and 21st followed by temperatures below freezing on the 24th and 25th, a minimum of 22° F. being recorded at Washington on the morning of the 25th.[1]

THE CLIMATE OF MADISON, WIS.

By JAMES L. BARTLETT, B. S., Observer, U. S. Weather Bureau. Dated November 27, 1905.

TOPOGRAPHY.

Madison, Wis., latitude, 43° 05′ north; longitude, 89° 23′ west, is situated in the southern portion of the State, about 75 miles west of Lake Michigan and the same distance from the nearest point of the Mississippi River. Locally, the city occupies a strip of land one-half to three-quarters of a mile wide, lying directly between Lakes Mendota and Monona, the former of which has an area of fifteen, and the latter an area of five square miles. The main portion of the city extends along the south shore of the larger lake. The site as well as the surrounding country is slightly rolling, some of the hills rising 100 feet, or more, above the level of the lakes. The elevation of the surface of Lake Mendota above mean sea level is 849 feet (see fig. 4).

HISTORICAL.

Meteorological observations were begun in Madison at the north dormitory of the University of Wisconsin, by Prof. S. H.

[11] The exponent when employed with this symbol should indicate degree of brightness or intensity, not relative frequency.—*S. P. F.*

[12] The definition of a gale varies with every locality. At some places, notably Mount Washington, and Ben Nevis, winds of 10 to 15 meters per second, 22 to 33 miles per hour, are too numerous to be noteworthy, while at less exposed places they would be quite rare, hence the symbol should indicate the occurence of an unusually strong wind or gale.—*S. P. F.*

[13] The exponent should indicate brightness, not size or complexity of structure.—*S. P. F.*

[1] See Monthly Weather Review, vol. 26, p. 217, and vol. 33, pp. 157-8.